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NUCLEAR REGULATORY COMMISSION

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:)	Docket No. 72-22-ISFSI
PRIVATE FUEL STORAGE, LLC)	ASLBP No. 97-732-02-ISFSI
(Independent Spent Fuel)	
Storage Installation))	October 25, 2002

ERRATA TO STATE OF UTAH'S REPLY TO PROPOSED FINDINGS OF FACT
AND CONCLUSIONS OF LAW OF THE APPLICANT AND NRC STAFF ON
UNIFIED CONTENTION UTAH L/QQ

In meeting the October 16, 2002 deadline for filing the State's Reply to Proposed Findings of Fact and Conclusions of Law on Unified Contention Utah L/QQ, certain typographical, grammatical, punctuation, and other errors in the final document escaped our notice. The attached errata corrects some of these errors, in particular, those that are factually incorrect and those that affect the readability of the document. Additionally, although filed electronically, paper copies of the Conservatism Table mentioned in footnote 4 on page 16 of the Reply Findings, Title page, and Table of Contents were inadvertently omitted from the paper copy of the State's Reply Findings when it was assembled for mailing on October 16. Paper copies of these three parts (including page numbers in the Table of Contents) to the State's Reply Findings are enclosed.

DATED this 25th day of October, 2002.

Respectfully submitted,



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CERTIFICATE OF SERVICE

I hereby certify that a copy of ERRATA TO STATE OF UTAH'S REPLY TO PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW OF THE APPLICANT AND NRC STAFF ON UNIFIED CONTENTION UTAH L/QQ was served on the persons listed below by electronic mail (unless otherwise noted) with conforming copies by United States mail first class, this 25th day of October, 2002:

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**ERRATA TO STATE OF UTAH'S REPLY TO PROPOSED FINDINGS OF FACT
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October 25, 2002

Pg	Ln	Correction
14	16	Ostadan offered testimony similar to that of Mr. <u>Dr.</u> Bartlett.
16	4-5	analysis. Moreover, this is the first seismic ISFSI design to come before the NRC for a <u>high</u> seismic site. Whatever decision the Board <u>makes</u> in
24	6-7	sliding analysis in analyses of foundations on highly layered <u>soil</u> deposits are not controlled not by the average but by the minimum shear strength value in a critical <u>soil</u> layer.
37	5	assurance it will competently carry out the remainder to of the tests and
41	11	develop internally due to inertia <u>inertial</u> loading caused by seismic
50	19	because <u>of</u> the high contrast in stiffness and strain incompatibility
56	11-12	significant and the Applicant is relying solely on Holtec's non-linear analyses, it is reasonable <u>to expect</u> that Holtec's soil spring and damping values are <u>should be</u> confirmed with an alternate method.
64	2, Fn 25	computer simulations <u>in</u> which it commissioned.
77	7-8	Whereas Holtec performed other eight casks per pad runs with using DYNAMO and VisualNastran, Holtec <u>it</u> estimated the maximum cask displacements
79	2-3, Fn 43	The <u>Using the contact stiffness of 38.19 million pounds per inch resulted in the displacements for cask # 5 increased increasing over five times the displacement estimated for cask # 5 using when a contact stiffness of 454 million pounds per inch was used.</u>
89	11	Moreover, NRC's <u>Staff</u> opinions must "pass[] the same scrutiny
89	13	Thus, NRC's <u>Staff's</u> acceptance of the DYNAMO model does not
90	14-17	Additionally, in its proposed findings, the Applicant makes several attempts to discredit Dr. Khan's parametric study. Even without Dr. Khan's persuasive parametric study, the Applicant acknowledges that "dynamic analyses are extremely sensitive" to contact stiffness values. PFS Findings ¶ 171.

Pg	Ln	Correction
90	18-21	Therefore, the facts <u>not</u> in dispute are (a) the dynamic behavior of the casks are extremely sensitive to the contact stiffness value, (b) the contact stiffness value used to support PFS's license application essentially limits the dynamic vertical behavior, (c) <u>(b)</u> there is no test data to validate Holtec's contact stiffness value, (d) <u>(c)</u> because the cask
91	1	in the license application DYNAMO analyses, and (e) <u>(d)</u> dynamic
93	7-8, Fn 50	Moreover, PFS itself contradicts Holtec's claims in PFS Findings ¶ 171, when it admitted that dynamic analysis is extremely sensitive to the contact stiffness values:
94	7-8	run. <u>Id.</u> In complete agreement with Dr. Khan, the Applicant states that dynamic computer analyses are "extremely sensitive" to the contact stiffness value.
101	16	(i) Dr. Luk did not model the PFS site <u>correctly</u> and furthermore
102	4	State will respond., Specifically <u>specifically</u> , the Staff's rendition of the
116	10	concluded no breach of canister even in the <u>event</u> of tip over given the
135	8	The Skull Valley site, directly below <u>above</u> an active fault

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Examples from PFS Findings: PFS's Reliance on Conservatism & State Comment

¶ - PFS Findings	Excerpt from PFS Findings	State Comment
¶ 43	“Even if soils of lower strength were to exist in the pad placement area, the conservatisms incorporated into the PFS analyses and design . . . would more than compensate for the difference in that hypothetical lower strength and that utilized by PFS in its analyses.”	No evidence or design calculations to support claim; decreases margin of safety
¶ 55	“[I]f an error existed because the shear strength of the soils under the building was less than the value selected by PFS, the very large margin available against bearing capacity failure of the CTB” would render inconsequential the State’s testimony that PFS used unconservative estimates of the undrained shear strength in the dynamic bearing capacity.	No analysis; decreases margin of safety
¶ 58	“[T]he approach followed by PFS in establishing the strength and other characteristics of the soils is exceptionally conservative.” Based on this claim, PFS concludes the State’s concern re soil shear strength and factors of safety against soil failure are answered by “the conservatisms built into the methodology used by PFS in determining the soils properties and factors of safety. . . would be sufficient to assure that the soils conditions are adequate to meet the anticipated foundation loadings.”	PFS attempts to eliminate most of the State’s issues in Contention Part C. No evidence to overcome State’s challenge to shear strength of clays, soil variability, inadequacy of sampling and testing. E.g., PFS ignores lower undrained direct shear strength values in the upper Bonneville clays found near the CTB than those used in the design calculations for the pad emplacement area.
¶ 65	“While the soil cement ‘frame’ surrounding the storage pads provide passive resistance against sliding of the pads, PFS conservatively does not take credit for such resistance.”	No evidence that the frame will provide passive resistance (e.g., cement frame may pre-cracked from tensile stresses developed during the seismic event). Soil cement frame causes a significant change in load path from PFS’s base analysis due to pad to pad interaction

¶ - PFS Findings	Excerpt from PFS Findings	State Comment
¶ 107	PFS removes conservatisms from its analysis to assert that the long term settlement of the pad will be 0.5" and such a "small" settlement will not result in any significant cracking in the soil cement.	Unrealistic to estimate settlement in 1/10th inch and to claim a total mass of 1440 tons sitting on a 3 ft. thick concrete pad will settle only ½". No calculation to support presumed ½ " of settlement. With requisite conservatisms included, PFS's calculated long term settlement more than triples to about 2". No evidence that 2" will not cause cracking or separation of the soil cement around the pads .
¶ 217	"The use of a higher Young's modulus for the cement-treated soil is a conservative design element that addresses" the State's expert testimony regarding the forces transferred to the casks due to sliding.	Dr. Luk modeled the wrong site conditions. Dynamic analysis sensitive to input parameters; cannot draw conclusions from using wrong input value in a non-linear analysis.
¶ 254	"[T]he testimony by the Applicant establishes that there are significant conservatisms in the analysis and design of the foundations of the CTB and the storage pads, such that the actual margins against the mechanisms for potential foundation failure are much larger than the State credits in its testimony."	No analysis to support claim.
¶ 278	PFS relies on the large margins against overturning and cask-to-cask impact provided for in the Holtec design to compensate should the frequency dependence of the soil spring and damping be insufficiently accounted for in the Holtec analyses.	No analysis to support claim. The Holtec analysis is at the heart of the State's dispute; there are no margins in the analysis.

¶ - PFS Findings	Excerpt from PFS Findings	State Comment
¶¶ 281, 282	Pad settlement is based on conservative assumptions for 1.75 in. for the total long-term settlement. ¶ 281. “[B]ased on the conservatisms incorporated in the pad static settlement analyses, the actual long-term static settlement of the pads that can be reasonably expected to occur would be much less than the 1.75 inches that is predicated in the Stone and Webster calculations – only one fourth to one third of this estimated value, or approximately ½ inch.” ¶ 282	The ½ " of presumed settlement is not based on any calculation, but solely on a PFS unsupported supposition put forth in hearing testimony. It is unrealistic to estimate settlement in 1/10ths of an inch; also unrealistic that a total mass of 1440 tons sitting on a 3 foot thick concrete pad will settle only ½ inch.
¶ 309	PFS tries to dismiss State witnesses testimony that pad-to-pad interaction would be magnified if the pads actually were to slide because “the design of the cement-treated soil will provide a large margin against the potential sliding of the pads.”	PFS has not demonstrated adequate margins against pad sliding. No soil cement testing to support design. No analysis of horizontal forces from pad to pad interaction in pad sliding calculations.
¶ 332	“The design basis of the pads provides a conservatively calculated factor of safety against sliding that exceeds 1.1; therefore, the pads do not slide.”	State challenges PFS’s sliding analysis and soil properties used in that analysis.
¶ 346	“The calculations performed by Holtec show that there are very large margins in the range of cask movements calculated for the design basis earthquake. Any small additional motion induced by inclined waves would be insignificant and would be absorbed by these margins.”	State vigorously contests margins for safety in Holtec analysis. Holtec did not bound effect of non-vertical seismic waves by deliberately inducing 5% loading eccentricity into cask stability model per ASCE 4-94; Holtec merely modeled less than 8 casks per pad without 5% loading. Tr. (Soler) 6005.

¶ - PFS Findings	Excerpt from PFS Findings	State Comment
¶ 391	<p>“There are substantial conservatisms included in the CTB sliding stability calculation, which provide additional margins of safety against sliding. Because of these conservatisms, it is unlikely that the building would actually experience sliding even if the calculated factor of safety were to drop somewhat below 1.0.”</p>	<p>No analysis to support conclusion. As a calculated factor of safety of 1.1 means a 10% margin of safety then a factor of safety against sliding of 1.0 means there is no margin but potential sliding. <i>See Tr. (Trudeau) at 6165).</i></p>
¶¶ 425, 428	<p>PFS witness Dr. Cornell concluded that the risk reduction factors applicable to the SSCs are 5 to 20 or greater. Dr. Cornell “based [this conclusion] on his familiarity with conservatisms embodied in nuclear codes and standards and evidence of actual conservatisms in the PFSF seismic design.”</p>	<p>Dr. Cornell reliance on PFS’s conservatism of design is not supported by the record.</p>

¶ - PFS Findings	Excerpt from PFS Findings	State Comment
¶ 438	<p>“[T]he factor of safety that PFS calculated for the storage pads against sliding was obtained by applying the following conservatisms”:</p> <ul style="list-style-type: none"> • Excluding passive resistance of soil cement around the storage pad; • Using the static shear strength of the clays; • Using the lower bound strength from weakest soil layer; • Soil sampling disturbance inaccurately measures strength values; and • Earthquake cycling and its peak magnitude only occur briefly. 	<ul style="list-style-type: none"> • PFS cannot ignore the forces imparted by soil cement as a pushing force. • Static shear strength can over-estimate shear strength available in dynamic case if soil’s strength degrades significantly. No cyclic strain-controlled testing at levels of strain expected under pads to show no significant degradation of strength. • PFS cannot claim it has used the lowest strength for the weakest soil layer based on a sample of 1. • Significant sample disturbance in its testing program is contrary to PFS’s position that the Bonneville clay is a stiff clay and that the testing program was carried out in a professional manner and with reasonable care • Not a recognized earthquake engineering concept to only look at peak cycling. If foundation system/soil reaches failure from peak stress, deformation may increase from subsequent earthquake cycles.
¶ 439	<p>“PFS’s calculation of the minimum factors of safety against pad sliding are ‘exceptionally conservative.’ Removing the various conservatisms in the calculation would result in a much greater factor of safety against pad sliding.”</p>	<p>State challenges PFS pad sliding analysis.</p>
¶ 444	<p>“There are also numerous conservatisms included in the design of the foundations of the CTB such that, . . .[a] failure of the CTB due to overturning or loss of bearing capacity would not occur for a beyond-design basis earthquake event.”</p>	<p>No analysis to support claim.</p>

¶ - PFS Findings	Excerpt from PFS Findings	State Comment
¶ 446	PFS concludes that it is not necessary to do a formal 10,000-year return period earthquake evaluation to show a lack of SSC failure in the event of a 10,000- year earthquake. PFS states that “[o]ne can determine . . . that sufficient conservatisms exist in the design of the SSCs and their foundations to meet the increase in loadings due to the higher ground accelerations for the 10,000-year event.”	If the PFS facility can withstand a 10,000-year earthquake, then why is PFS requesting an exemption from the design basis earthquake? No substantive evidence or design calculations to support claim for 10,000-year event.
¶ 456	“Thus, the Staff recognized the conservatisms in the design of SSCs at the PFSF that enable the SSCs to withstand earthquakes more severe than the DBE 2,000-year mean return period. The Staff did not, however, attempt to formally quantify those conservatisms or to arrive at an applicable risk reduction factor, as done by PFS.”	The Staff’s testimony offers no support for PFS’s rationale for granting the exemption.
¶¶ 516, 518, 519	“The PFS site-specific analysis for radiation dose levels uses a 2,000 hours/year occupancy time for calculating normal operating dose levels (conservatively based on an assumed worker at the site boundary 40 hours a week for 50 weeks a year), whereas the HI-STORM CoC uses 8,760 hours/year to calculate the normal operating dose.” ¶ 516. Claim that 2,000 hours per years is conservatively high based on surrounding land use. ¶ 518. Similar claim that 2,000 hours is conservatively high for normal operations as well as for postulated accident conditions. ¶ 519.	The regulations require assumption of 8,760 hours at the fence post for accidents; 2,000 hours is not only nonconservative, it is four times too low.
¶ 535	“The spent fuel assemblies have design margins that allow them to withstand accelerations up to at least 63g.”	No analysis to support claim.
¶ 536	“The MPC also has substantial design margins beyond the 45g level.”	No analysis to support claim